REMARKS

Claims 12-25 are pending in the present Application. Of these, Claims 12 and 18 have been amended, and Claims 26-28 have been added by this Amendment and Response, leaving Claims 12-28 for consideration upon entry of the present Amendment.

Claims 12 and 18 have been amended to clarify the claimed invention for the Examiner. Support for these amendments can be found, for example, in original Claims 12 and 18, and in the Specification at Paragraphs [0014], [0023], [0025]-[0026], [0070]-[0075], Examples 1 and 2, and Figures 4b and 8.

Reconsideration and allowance of the claims are respectfully requested in view of the above amendments and the following remarks.

Claim Rejections Under 35 U.S.C. § 103(a)

Claims 12, 14, 16-19, 22, 24, and 25 stand rejected under 35 U.S.C. § 103(a), as allegedly unpatentable over United States Publication No. 2003/0003339 to Keegan (Keegan) in view of JP 02-238288 to Shiomi, et al. (Shiomi). Claims 13 and 20 stand rejected under 35 U.S.C. § 103(a), as allegedly unpatentable over Keegan in view of Shiomi and further in view of JP 06-318736 to Kaneko (Kaneko). Claims 15 and 23 stand rejected under 35 U.S.C. § 103(a), as allegedly unpatentable over Keegan in view of Shiomi and further in view of United States Patent No. 5,753,383 to Cargnelli, et al. (Cargnelli). Claim 21 stands rejected under 35 U.S.C. § 103(a), as allegedly unpatentable over Keegan in view of Shiomi and further in view of United States Publication No. 2003/0044662 to Walsh (Walsh). Because the rejections are related, they are addressed together. Applicants respectfully traverse these rejections.

Regarding Claims 12 and 18, the Office Action asserts, on Page 3, that the Keegan reference discloses measuring the temperature of the electrochemical cells adjacent to the thermoelectric layers at one or more locations across the electrochemical cells. However, Claims 12 and 18 have been amended to recite measuring the operating temperature of the fuel cell assembly in contact with a thermoelectric layer. At most, Keegan discloses that the interconnect acts as a heating element to heat up each electrochemical cell to a desired temperature to allow for startup of the SOFC stack (Keegan, Paragraph [0029]). Keegan further discloses that once

the interconnect reaches a sufficient temperature the switch opens stopping the flow of electricity (Keegan, Paragraph [0031]). Thus, the interconnect of Keegan is simply heated to a specified temperature in order to bring the SOFC stack up to a temperature sufficient to start the stack. In Keegan, once the stack is at a sufficient temperature the interconnect is turned off. Because the interconnect is off prior to operation of the cell stack, Keegan fails to disclose measuring the operating temperature of the fuel cell assembly, as claimed.

The Office Action further asserts, on Page 4, that Keegan discloses utilizing the heated interconnects to provide uniform heating of the SOFC stack. As discussed, Keegan discloses that an interconnect can serve as a heating element to provide for a uniform heating of the SOFC stack (Keegan, Paragraph [0023]). Thus, Keegan discloses that the interconnect can uniformly provide heat to the cell stack. In contrast, claims 12 and 18 recite that the heat distribution of the fuel cell assembly is substantially uniform. In the present claims, the temperature of the fuel cell assembly is maintained at a substantially uniform temperature across each cell in the stack in order to provide optimal operating conditions for the stack. Thus, uniformly providing heat to the cell stack is not the same as maintaining an assembly of a cell stack at a substantially uniform temperature. Keegan thus fails to disclose that the heat distribution of the fuel cell assembly is substantially uniform, as claimed.

Regarding Claim 18, the Office Action additionally asserts, on Page 3, that Keegan discloses an end cap that is capable of functioning as a heat sink in thermal contact with a periphery of the fuel cell stack. Applicants respectfully disagree. At most, Keegan discloses that the end cap 20 includes a surface that is configured for disposal adjacent to the anode for both electrical contact and to provide fuel distribution (Keegan, Paragraph [0015], Figure 1). Thus, the end cap functions to provide electrical contact and fuel distribution for the cell stack. In addition, Figure 1 clearly illustrates that the end cap is simply an interconnect having only a second interconnect surface such that the end of the fuel cell stack can be sealed (Keegan, Figure 1). Since the end cap is actually a component of the fuel cell stack, it is not a heat sink that is in thermal contact with a periphery of the fuel cell stack as asserted by the Office Action.

The Office Action turns to Shiomi to overcome the deficiencies of Keegan. Applicants note that Shiomi fails to disclose or suggest measuring the operating temperature of a fuel cell assembly, that the heat distribution of a fuel cell assembly is substantially uniform, or that a heat

sink is provided which is in thermal contact with a periphery of the fuel cell stack, as claimed. Shiomi thus fails to overcome the deficiencies of Keegan, as discussed above.

The Office Action admits, on page 4, that Keegan does not disclose adjusting the voltage of the power source in response to the measured temperature to heat or cool the temperature of the at least one fuel cell assembly. The Office Action relies on Shiomi to disclose this feature. At most, Shiomi discloses an induction heater that is arranged adjacent to a refractory material to be heated (Shiomi, Abstract). Shiomi further discloses that the temperature within a cavity is compared with a temperature pattern stored in advance in an adjustor and a voltage of a variable voltage source is controlled in response to that result (Shiomi, Abstract). However, Shiomi simply discloses a device that heats a refractory material. In Shiomi, the voltage source is controlled to adjust the amount of heat output by the heater. In other words, the induction heater of Shiomi is simply turned on and off in order to adjust the temperature of the refractory material by either actively heating or by allowing heat to dissipate from the material. Nowhere does Shiomi disclose or suggest that the induction heater actively cools the refractory material.

In contrast, claims 12 and 18 have been amended to recite, *inter alia*, measuring the operating temperature of the fuel cell assembly in contact with a thermoelectric layer; and adjusting a voltage of a power source in response to the measured temperature to heat or cool the fuel cell assembly. Paragraphs [0014] and [0017] of the specification state that, in order to perform optimally, fuel cells should be maintained at a certain temperature that is nearly uniform across each cell in the stack. For example, at high temperatures, the catalyst may be destroyed, while at low temperatures, ice may form within the fuel cell assembly. In addition, the catalyst efficiency decreases when the catalyst temperature falls outside an optimal range. Thus, it is important to control the temperature within the fuel cell assembly by either heating or cooling the assembly in order to prevent hot and cold zones that prevent optimal performance of the fuel cell. Therefore, it is important that the thermoelectric layer have the ability to switch back and forth between actively heating and actively cooling the fuel cell assembly during operation of the fuel cell. *See* specification at, for example, paragraph [0063]. Because the induction layer of Shiomi is only able to adjust the temperature by turning on and off, Shiomi simply allows the refractive material to drop in temperature by allowing accumulated heat to dissipate when the heating element is turned off. Thus, Shiomi fails to disclose measuring the operating temperature of a

fuel cell assembly in contact with a thermoelectric layer; and adjusting a voltage of a power source in response to the measured temperature to heat or cool the fuel cell assembly, as claimed.

Claims 14, 16-17, 19, 22, 24, and 25 variously depend from claims 12 and 18. Because the combination of Keegan and Shiomi fails to disclose or suggest the features recited in independent claims 12 and 18; dependent claims 14, 16-17, 19, 22, 24, and 25 are patentable for at least the reasons that claims 12 and 18 are patentable. However, claims 17, 19, and 25 also add further patentable distinction. For example, the references alone and in combination fail to disclose or suggest a method further comprising contacting a periphery of the fuel cell assembly with a heat sink (e.g. claim 17), a method wherein each thermoelectric layer further comprises one or more temperature-sensing devices each associated with one or more thermoelectric devices and connected via control circuitry to the power sources to which the associated thermoelectric devices are connected (e.g. claim 19), or a method wherein the temperature is substantially uniform across the fuel cell assembly(e.g. claim 25).

The Office Action further rejects dependent claims 13 and 20 over Kaneko. Claims 13 and 20 depend from claims 12 and 18. Applicants note that Kaneko also fails to disclose or suggest measuring the operating temperature of a fuel cell assembly in contact with a thermoelectric layer; adjusting a voltage of a power source in response to the measured temperature to heat or cool the fuel cell assembly; that the heat distribution of a fuel cell assembly is substantially uniform; or that a heat sink is provided which is in thermal contact with a periphery of the fuel cell stack, as claimed. Kaneko thus fails to overcome the deficiencies of Shiomi and Keegan, as discussed above. Because the combination of Keegan, Shiomi, and Kaneko fails to disclose or suggest the features recited in independent claims 12 and 18; dependent claims 13 and 20 are allowable for at least the reasons that claims 12 and 18 are allowable.

The Office Action further rejects dependent claims 15 and 23 over Cargnelli. Claims 15 and 23 variously depend from Claims 12 and 18. Applicants note that Cargnelli also fails to disclose or suggest measuring the operating temperature of a fuel cell assembly in contact with a thermoelectric layer; adjusting a voltage of a power source in response to the measured temperature to heat or cool the fuel cell assembly; that the heat distribution of a fuel cell assembly is substantially uniform; or that a heat sink is provided which is in thermal contact with

a periphery of the fuel cell stack, as claimed. Because the combination of Keegan, Shiomi, and Kaneko fails to disclose or suggest the features recited in independent claims 12 and 18; dependent claims 15 and 23 are allowable for at least the reasons that claims 12 and 18 are allowable. However, Claims 15 and 23 also add further patentable distinction. The Office Action relies on Cargnelli to disclose that the thermoelectric element is electrically connected to the fuel cell stack so that the fuel cell current can be applied to the thermoelectric element (Office Action, page 7). However, at most, Cargnelli discloses a system comprising a fuel cell stack, a catalytic burner module and a thermoelectric module (Cargnelli, col. 5, lines 20-22). In Cargnelli, the thermoelectric element is located inside the thermoelectric module not inside the fuel cell stack (Cargnelli, col. 5, lines 24-28, figs 1 and 2). Cargnelli thus fails to disclose or suggest that a thermoelectric layer that is in contact with a fuel cell assembly or that is provided between adjacent fuel cell assemblies in the fuel cell stack may have a fuel cell as the power source, as claimed.

The Office Action further rejects dependent claim 21 over Walsh. Claim 21 depends from independent claim 18. Applicants note that Walsh also fails to disclose or suggest measuring the operating temperature of a fuel cell assembly in contact with a thermoelectric layer; adjusting a voltage of a power source in response to the measured temperature to heat or cool the fuel cell assembly; that the heat distribution of a fuel cell assembly is substantially uniform; or that a heat sink is provided which is in thermal contact with a periphery of the fuel cell stack, as claimed. Walsh thus fails to overcome the deficiencies of Shiomi and Keegan, as discussed above. Because the combination of Keegan, Shiomi, and Walsh fails to disclose or suggest the features recited in independent claim 18; dependent claim 21 is allowable for at least the reasons that claim 18 is allowable. Reconsideration and withdrawal of these rejections are respectfully requested.

Claims 12, 14, 16-19, 22, 24, and 25 stand rejected under 35 U.S.C. § 103(a), as allegedly unpatentable over Keegan in view of United States Patent No. 5,138,136 to Moreau, et al. (Moreau). Applicants respectfully traverse this rejection.

As previously discussed, Keegan fails to disclose providing a heat sink in thermal contact with a periphery of the fuel cell stack; measuring the operating temperature of fuel cell assemblies adjacent to the thermoelectric layers; and adjusting the voltage of the power source in

response to the measured temperatures to heat or cool the temperature of the at least one fuel cell assembly in contact with the thermoelectric layer at the one or more locations of the fuel cell stack, wherein a heat distribution of the fuel cell assembly is substantially uniform.

The Office Action admits, on Page 5, that Keegan does not disclose adjusting the voltage of the power source in response to the measured temperature to heat or cool the temperature of the at least one fuel cell assembly. The Office Action relies on Moreau to disclose this feature. Each of Claims 12 and 18 have been amended to recite, *inter alia*, adjusting a voltage of a power source in response to the measured temperature to cool the fuel cell assembly. At most, Moreau discloses controlling the ac and dc currents for adjusting the voltage supplied to terminals of the thermoresistance as a function of the heating power to be delivered to the member (Moreau, Claim 1). However, Moreau simply discloses a circuit for processing an electrical power supply signal for a resistive heating element. In other words, the resistive heating element is simply turned on and off in order to adjust the temperature of the heating element such that the element will either actively heat or allow heat to dissipate from a member. Nowhere does Moreau disclose or suggest that the resistive heating element is adjusted to cool the member. Moreau thus fails to disclose adjusting a voltage of a power source in response to the measured temperature to cool the fuel cell assembly, as claimed.

Claims 14, 16-17, 19, 22, 24, and 25 variously depend from Claims 12 and 18. Because the combination of Keegan and Moreau fails to disclose or suggest the features recited in Independent Claims 12 and 18; Dependent Claims 14, 16-17, 19, 22, 24, and 25 are patentable for at least the reasons that Claims 12 and 18 are patentable. However, Claims 17, 19, and 25 also add further patentable distinction. For example, the references alone and in combination fail to disclose or suggest a method further comprising contacting a periphery of the fuel cell assembly with a heat sink (e.g. Claim 17), a method wherein each thermoelectric layer further comprises one or more temperature-sensing devices each associated with one or more thermoelectric devices and connected via control circuitry to the power sources to which the associated thermoelectric devices are connected (e.g. Claim 19), or a method wherein the temperature is substantially uniform across the fuel cell assembly(e.g. Claim 25).

Reconsideration and withdrawal of this rejection is respectfully requested.

New Claims

By this Amendment, New Claims 26 and 27 are presented. New Claims 26 and 27 depend from Claim 12 and 18 and, thus, distinguish over the applied references for at least the reasons discussed above with respect to claims 12 and 18. New Claims 26 and 27 are each directed, *inter alia*, to a method further comprising measuring the start-up temperature of the fuel cell assembly in contact with a thermoelectric layer; and adjusting the voltage of the power source in response to the measured temperature to heat the fuel cell assembly. Support for New Claims 26 and 27 can be found, for example, in original Claims 12 and 18, and in the Specification at Paragraphs [0023], [0025]-[0026], and [0071]. New Claim 26 and 27 are believed to be patentable over the cited references. Prompt examination and allowance of New Claims 26 and 27 are respectfully requested.

It is believed that the foregoing amendments and remarks fully comply with the Office Action and that the claims herein should now be allowable to Applicants. Accordingly, reconsideration and allowance are requested.

If there are any additional charges with respect to this Amendment or otherwise, please charge them to Deposit Account No. 06-1130.

Respectfully submitted,

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